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A REPORT ON THE EXHAUST EMISSIONS OF THE 1971 PRODUCTION VERSION OF THE ARMY M-151 JEEP

John C. Thomson

Environmental Protection Agency
Ann Arbor, Michigan

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John C. Thomson
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16. Abstracts

As part of a continuous evaluation program of vehicles for the U. S. Army Tank-Automotive Command, two new Army M-151's were evaluated. The vehicles tested were built during the start of production in 1971 and had fewer than 60 miles when received. This standard Army "Jeep" has provisions for two or four wheel drive, a 4-speed manual transmission and a 4-cylinder engine. The engine, an Army designed overhead valve 4-cylinder, displacing 141 cu. in., was designed to be operated over a wide range of temperatures and grades. All tests were run using the 1972 Federal emission test procedure which involves the LA4-S4 driving schedule. The conclusions drawn from the results are as follows: (1) the emission levels of the M-151 are quite high when compared to controlled production automobiles and trucks; (2) the emission levels of the M-151 compare with the uncontrolled car population produced prior to 1966; (3) evaporative emission levels appear to be higher than the current standards.

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Air pollution
Exhaust emissions
Military vehicles
Tests
Standards
Sampling
Hydrocarbons
Carbon monoxide
Carbon dioxide
Nitrogen oxides
Evaporation

17b. Identifiers/Open-Ended Terms

M-151 Jeep
Federal Test Procedure (1972)
LA4-S4 driving schedule
Constant Volume Sampling Technique (CVS)

17c. COSATI Field/Group 13B

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Vehicles Tested

As part of a continuous evaluation program of vehicles for the U. S. Army Tank-Automotive Command, two new Army M-151's were evaluated according to the 1972 Federal emission test procedure. The vehicles tested were built during the start of production in 1971 and had fewer than 60 miles when received. This is the standard Army "Jeep" with provisions for two or four wheel drive, a four speed manual transmission and a four cylinder engine. The engine is an Army designed overhead valve four cylinder, displacing 141 cubic inches. The engine is designed to be operated over a wide range of temperatures and grades and has provisions for underwater operation up to five feet. For fording purposes, all vents from the engine, and fuel tank dump into the oil bath air cleaner, the fuel tank is vented to atmosphere in normal operation.

Tests Performed

All tests reported in Table 1 were run using the 1972 Federal emission test procedure. This is a 23 minute non-repetitive driving schedule (LA 4-S4) run on a chassis dynamometer. Exhaust emissions are collected using a constant volume sampler (CVS) with a portion of the dilute exhaust bagged for analysis. The analysis system measures unburned hydrocarbons (HC) using a flame ionization detector (FID) while carbon monoxide (CO) and carbon dioxide (CO_2) are measured with non-dispersive infrared analyzers (NDIR). Two systems were used for measuring oxides of nitrogen with results reported by both chemiluminescence (CI) and modified Saltzman (Saltz). All NO_x results are converted to NO_2 and corrected for humidity. All of the results are reported in grams per mile.

In addition to the exhaust emission tests, evaporative emission losses were measured. In these tests an activated charcoal filter is connected to the fuel tank and any other potential source of fuel loss during a hot soak. The procedure is spelled out in the Federal Register dated November 10, 1970. The test requires a conditioning prior to the soak and also heating of the fuel tank.

Results

Emission tests results are reported in Table 1. The vehicle average hydrocarbons of 4.9 and 5.8 are considerably above the 1972 Federal standard of 3.4 grams per mile (gpm). The carbon monoxide values of more than 100 gpm are almost three

times the standard of 39 gpm. These cars show values that are typical of the uncontrolled cars that were built prior to 1966.

In Table 2, results from the evaporative emission tests are reported. The standard is presently 2.0 grams. The standard is being met by one of the vehicles but not the other. Additional evaluations using an enclosed shed are planned to check these results.

The emission results found during this test essentially duplicated levels found on previous M-151's tested by this laboratory.

Conclusions

1. The emission levels of the M-151 are quite high when compared to controlled production automobiles and trucks.

2. The emission levels of the M-151 compare with the uncontrolled car population produced prior to 1966.

3. Evaporative emission levels appear to be higher than the current standards.

Table 1

1972 Federal Emission Test (LA-4)
All Numbers in Grams Per Mile

	HC FID	CO NDIR	CO_2 NDIR	NO_X Saltz	NO_X CI
		Vehicle No. 02LJ7871			
	5.0	150+	420	---	0.6
	5.5	128	420	1.3	1.9
	3.9	101	444	2.0	2.1
	7.5	150+	410	1.4	1.2
	4.4	110	478	2.4	2.1
	5.0	109	445	2.3	2.1
	3.2	87	318	1.3	1.3
Average	4.9	119+	419	1.8	1.6
		Vehicle No. 02LK2771			
	6.2	103	387	1.8	1.8
	4.8	115	456	2.0	3.0
	7.3	137	440	2.1	2.3
	5.0	103	355	1.8	1.6
	5.9	102	381	2.3	1.8
Average	5.8	112	404	2.0	2.1

Table 2

Canister Evaporative Emission Test
All Results in grams

	Carburetor	Fuel Tank	Total
		Vehicle no. 02LJ7871	
	0	4.32	4.32
	0	2.35	2.35
	0	0.6	0.6
	0	1.99	1.99
	0	2.30	2.30
	0	2.67	2.67
Average			2.37
		Vehicle no. 02LK2771	
	0	----	----
	0	1.97	1.97
	0	0.55	0.55
			1.88
Average			1.47